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THE MYSTERY OF LIFE

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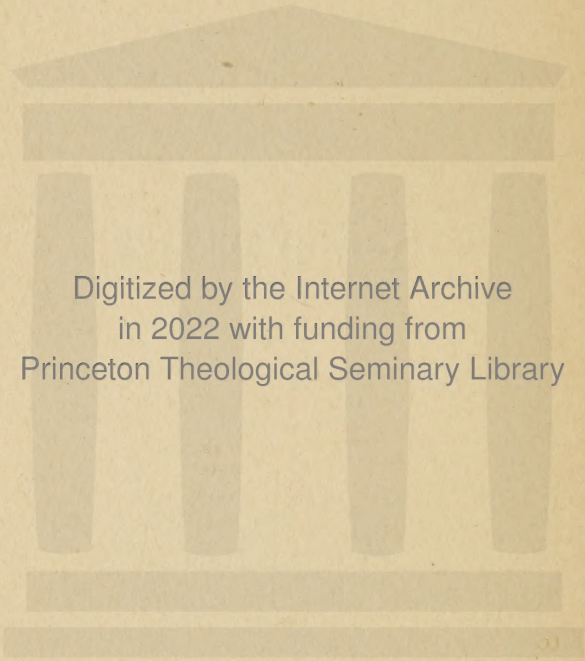
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BY

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PREFACE

THE subject treated in these twelve brief chapters was that which I chose for a Lenten course at St. Dunstan's-in-the-East. So much interest was aroused that I have been induced to give to the substance of the addresses a more permanent and systematic form.

In order to obviate the charge that the conclusions I have reached are of a somewhat indefinite character, I would have it remembered that I have throughout tried to place myself at the point of view of the scientist. On the basis of the teachings of Biology it would be impossible to rear a detailed philosophy of life, still less a technical theology. But I trust I have shown that Biology, so far from being hostile to religion, invites spiritual views of life, and leads us up to the temple, though it cannot enter the shrine.

J. EDWARD MERCER.

London, 1915.

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INTRODUCTION

FEW experiences stimulate more baffling or more searching questionings than a visit to some large and well-equipped museum of natural history. For there we can view, within easy limits of space and time, typical specimens of the myriad forms of life, denizens of air and land and water, ranging from the microscopically small to the gigantic, and bridging, with their inexhaustible succession, the mighty abysm of ages that separate the present from the remote geological past. On the one hand, one sees the delicate tracery of a fossil fern; on the other, the stark savagery of a dragon of the prime. The grotesque form of some deep-sea fish stands in startling contrast to the exquisite contours of a coral or of a bird of paradise. At every turn there is roused in us that sense of wonder from which philosophy is born. Whence streamed this marvellous succession of living creatures? What is its meaning? What its destiny?

Such questions are not of yesterday; they have a long and varied history. Each stage of

civilisation has wrestled with them in its own fashion, and has ventured on solutions, bizarre, crude or profound. More especially the Greeks, some two and a half millenniums ago, made guesses of the daring and brilliant kind we should expect from that phenomenal people. It was not, however, until quite recent times that there was an accumulation of accurate and systematised knowledge sufficient to allow of the framing of hypotheses worthy to be deemed really scientific. At present the rate of advance is very rapid, and many of the results are dazzling. But when we come to estimate the working value of these results, we find it is provocative rather than satisfying. Even as concerns the fundamental principles gained by induction from the garnered facts, there are serious clashings of debate. And as for the Whence and Whither of life on our globe, the most advanced science has not yet anything definite to tell us. Rather does the mystery seem to gather and deepen as the growing circle of light reveals the concurrently growing circle of darkness. A thick veil still hides from us the entrance to the temple of life.

Nevertheless, the wonderful strides we have made must count for something; indeed, they have won for biology a central place in the fields of modern research. A flood of light has been thrown on the old problems; and

a host of new problems of even wider import have come into view. Hopeful clues are being vigorously followed up, and far-reaching conclusions are winning general recognition. Nor is it the scientific world alone which is thus being stimulated to keen interest and unwonted activity. Students of many grades and kinds are striving to get their bearings in regard to the new knowledge, and to bring it into harmonious relation with their philosophy of life. And there are not a few who are somewhat anxiously wondering how it will affect their religious outlook—their thoughts of God, and their hopes for man.

I propose in what follows to expound, as clearly and tersely as I can, certain trends of speculation which have more particularly appealed to me in my attempts to assimilate the main teachings of present-day biology. It is the larger issues, rather than the technical details, which I shall have constantly in view. And I shall be guided throughout by the conviction that all science is ultimately an attempt to understand better the mind of God, and to penetrate more deeply into His modes of working. There is no place for dogmatism here—we have simply to feel our way, impelled by the divinely implanted craving for " more light," and cheered by the streaks of dawn that tell of the rising sun.

THE MYSTERY OF LIFE

CHAPTER I

WHENCE ?

LET our theories be what they may, they cannot alter the fact that there has been a vast and truly marvellous succession of living creatures on this planet of ours, and that they have manifested an increasing complexity of organisation as the ages have passed. Now this succession must have had a beginning. When was it ? How was it ? I leave the problem of " when " to geologists, and I press the questions—How did this life begin ?—Whence did it come ? By attempting to find answers to them, we shall find ourselves launched upon our main subject.

Let it be clear that in this chapter we are dealing with what are generally called " organisms "—that is to say, with members of the animal and vegetable kingdoms having bodies composed of interdependent parts. I guard myself thus, because, as I hope to show, there

is a wider sense in which life can be claimed for all forms of matter under all conditions. But organised life, in the narrower and more usual sense, could only exist on the globe when the surface had fallen below a certain degree of temperature. The furnace of a crematorium destroys all animal and vegetable bodies ; much more would the heat of the molten mass, from which the earth has cooled, be fatal to every form of life as we know it.

Putting ourselves back to the time, whenever it was, during which the lowest forms of organised life first got a footing on the earth's surface, we naturally and inevitably ask ourselves how they came to be there. For some people this problem is practically non-existent. They maintain that each successive species of living creatures was specially created by God, and that there is no more to be said. I hope at a later stage to deal with this venerable conception. Suffice it now to say that the whole trend of modern research is increasingly unfavourable to such an easy cutting of the Gordian knot. The belief in creation as such is not in any way inconsistent with science ; but it must be creation by continuous process, not by special acts, if it is to be in line with the evidence at our disposal.

Setting aside then, for the present, the idea of a series of separate creations, what other plausible hypotheses remain ? It would seem

that we are confined to a simple alternative. Life may have taken its rise upon our planet ; or it may have come to us from some other part of the universe. The latter supposition is the simpler ; and we will therefore open our definite investigation by a brief consideration of its main features.

Lord Kelvin, and a few other scientists, suggested that some organism was brought to our planet by a meteorite. That is to say, there was life on some other star, and a bit of it reached us ; and from this bit were developed the various types of living things which have diverged with such marvellous variety of shape, and size, and function, and habitat. It is easy to raise objections to this theory, and it has been treated accordingly with rather scant courtesy. It seems out of the bounds of possibility that a delicate organism, travelling about on a meteorite, could survive the cold of interstellar space, or the heat that would be generated by a fall through our atmosphere. But such difficulties, though obvious, are not really decisive ; for unfused salts and bituminous matter have actually been found inside meteorites. And why not organic matter ? Again it is argued that this explanation does not really explain ; it merely postpones a solution of the essential problem. For we have to go on (say these objectors) to ask how an organism came to the star which presented

life to us. If we say—from another star—the old query returns ; and so on indefinitely.

Now this objection is seemingly more serious ; but it is met by the fuller and more comprehensive theory propounded by the Swedish physicist and chemist, Arrhenius. We may call it the cosmozoic theory, inasmuch as it postulates that life exists eternally throughout the whole universe, as a parallel and concurrent mode of existence with matter. The detailed reasoning by which Arrhenius defends and elucidates his bold and striking speculations is not such as can easily be condensed, even when it is not too technical for our present purpose. He relies chiefly on what is known as the radiation power of light, and contends that, by the agency of this comparatively small force, microscopic particles of living matter are driven about through space. He contends that the cold, instead of destroying such living germs, preserves them ; and their lightness of course precludes the danger that threatens meteor-borne matter when passing through an atmosphere.

Whether, or no, we are converted by his brilliant argumentation, at any rate our imagination is stimulated by the opening up of new vistas and of vast ranges of possibilities hitherto little considered. For myself, I should gladly entertain this cosmozoic hypothesis, did I not see my way to an even yet more comprehensive

theory, which, while not at all negating the main contentions advanced by Arrhenius, does not make them a necessary condition of the appearance of life on any particular star.

So much for the solution that life came from outside. What of that solution which confines our attention to the limits of our own planet ? We are here confronted by certain very complex and very burning issues with which we must proceed to grapple as best we may.

CHAPTER II

Biogenesis—Abiogenesis

Two formidable-looking terms stand at the head of this chapter; but as they are exceedingly convenient, and save us from many circumlocutions, I will explain them and then venture on their constant use. So far as the composition of the word is concerned, abiogenesis is the negative member of the pair; but it is really the more positive in its meaning—it makes a claim which the other denies. The abiogenist contends that life (*bios*) can have its genesis from what is regarded as non-living matter. The biogenist contends that there is no proof of the possibility of such genesis. He challenges his opponent to produce evidence that there is any living matter which has not sprung from other living matter. *Omne vivum ex vivo,* is his war-cry. In short, abiogenesis implies the possibility of spontaneous generation; biogenesis denies it.

Let us note that the champion of abiogenesis need not commit himself to the contention that living things are now, or continuously, coming into existence by spontaneous generation; he

may hold that it was only under some exceptional and passing conditions in the past history of the globe that non-living matter could be converted into living matter. Whereas a consistent champion of biogenesis must hold and (if he can !) prove that there is an absolute chasm between the living and the non-living—a gulf which may not be crossed.

Let me at once declare myself to be utterly opposed to the idea of such a chasm. Here as elsewhere, I hold firmly to the principle of continuity. Nor, although it would be quite scientific, do I consider the crossing of the supposed chasm to be a unique event, happening in an unknown past. I am, indeed, prepared to allow a useful working distinction between the organic and the inorganic ; but I hold that the transition from one to the other is a thoroughly normal one, and that it is probably taking place on our globe year in and year out.

Now here is a thing that is passing strange ! Many religious people, and even learned theologians, deem the doctrine of continuity between the organic and the inorganic to be exceedingly suspicious, if not altogether worthy of severe condemnation. And yet until quite recently, hardly any one, religious or otherwise, held any other view. What led to a change of attitude so complete ? Undoubtedly it was the fear that such a doctrine would be in favour of a

materialistic science. But it was science itself that temporarily undermined the old, and practically universal belief! There is evidently much confusion here, and the issues are sadly in need of unprejudiced study.

I said that the contrary doctrine was comparatively modern; the facts are these. From the beginning of philosophic thought right up to the seventeenth century abiogenesis was practically taken for granted by poets and philosophers, by theologians and by scientists, by learned and by unlearned. However they might differ in other ways they were in agreement in this regard. Consider St. Paul's statement—"Thou foolish one, that which thou sowest is not quickened except it die." The substantial truth underlying this statement will be noticed later. Taking it simply as it stands, we see that St. Paul regarded it as a mark of folly, not to recognise that, so far from life being a condition of life, it was essential that death should supervene. To come down to Bacon (the father of modern science, as he is often called) we find that in his "New Atlantis" his philosopher-scientists are to make beasts, birds, reptiles and plants by due mixtures of the proper materials. Even so late and so eminent a naturalist as Buffon maintained abiogenesis.

The change in opinion on this matter was very gradually wrought by a long and exceedingly

interesting series of experiments, initiated in the seventeenth century, and concluded by Tyndall and Pasteur. Time after time it was shown that in apparent cases of the production of the organic from the inorganic, due precautions had not been taken, or sufficiently drastic means of destruction had not been employed. And now it is generally allowed that the weight of evidence is against those who claim to have actually succeeded in the artificial production of living matter. Be it observed that this is not the same thing as to deny the possibility of such production; but more of this anon.

It may be noted in passing that this series of experiments has wonderfully expanded our conceptions of the range of life. At first it was a question of eliminating maggots almost visible to the naked eye; but forms of life were successively discovered of ever more minute dimensions, ferments, microbes, bacteria, and still tinier organisms, passing at length out of the range of the most powerful microscopes.

CHAPTER III

More about Abiogenesis

We have learnt that the attempts to produce the organic from the inorganic have been negative in their results. And we have also noted that, in spite of such failure, the main issue is as undecided as ever. No discoveries have been made which would warrant us in saying that nature cannot do what has proved to be beyond our power, nor even in definitely concluding that scientists may not themselves at some future time achieve successes of a really positive character. Indeed, as we shall see directly, the results already attained are by no means so purely negative as some would have us think.

It would be folly, however, to underrate the magnitude of the difficulties that bar the way to an artificial production of a living organism. We do not yet know the structure of the simplest living matter, nor the forces which are at work in it. As for the conditions under which it can come into existence, perhaps they are of a highly special character, and may have passed

away ages ago; at any rate they are beyond our present means of research.

Again, we must not forget that our planet is very old, and that it has passed through a vast range of changes. Estimates based on various data allow for the life-epoch alone anything from 100,000,000 to 200,000,000 years. And the living types of to-day are descendants of an immense series extending back into that remote past. Imagine, then, the complexity that has been wrought in that stupendous span of time! Can we wonder that we have failed to analyse living matter, or to produce it in a laboratory?

And now for the other side of the shield. It is a remarkable fact that, in spite of the weight of such negative results, there is a strong and rapidly spreading conviction that, in ultimate principle, the older thinkers were right after all, and that there is no impassable barrier between living and non-living matter. Most of the old easy assumptions and immature observations have of course gone overboard; but the grand principle of continuity is, in this as in other regards, asserting itself with overwhelming insistence as the evidence accumulates and the deeper tendencies of nature reveal themselves with growing clearness. Let us briefly review some of the many causes which contribute to this resumption of a doctrine that for a time was so generally and so disdainfully discarded.

One of the most significant is the increasing difficulty of drawing any hard and fast lines between the spheres of physics, chemistry and biology. As the modes of investigation become more searching and accurate, the accepted definitions and distinctions cease to apply, and links between the organic and the inorganic are discovered in an almost unbroken chain. At every turn there are revealed inter-relations, inter-connections, actions and reactions which defy any isolating analysis.

Thus protoplasm, the semi-fluid, semi-transparent and colourless substance which forms the basis of life in plants and animals, is built up of oxygen, hydrogen, carbon and nitrogen—that is to say, of four of the inorganic elements. It manifests activities in which the mechanical, the chemical and the vital are so inextricably intermingled that if we modify one element we modify all. How can we avoid the strong suggestion of continuity? We see diffused matter taking form in crystals and colloids, and these, again, integrated into those living tissues which build up the various ranks of organisms, until we come to man as the crown of them all. We cannot yet trace all the links; but there is every reason to believe that the chain is unbroken.

Akin to this suggestive interdependence of activities, or rather a special case of it, is the

continuity of what we may call the food series. Carnivorous animals depend upon herbivorous animals for their food supply; and herbivorous on the plant world. But whence do plants derive their food? We find that they have to cross the boundary line into the world of the inorganic, and depend upon the direct assimilation of such inorganic substances as carbon, hydrogen, nitrogen, oxygen, sulphur and a few others, all of which exist in the atmosphere and in the crust of the earth in their "natural" condition. When we analyse the "living matter" we cannot find in its composition any new substances—only more complex combinations of the old materials which are as truly food for plants as grass is for the cow or the cow for man. Where is the chasm?

The mention of food leads us to consider a process which is supposed to be pre-eminently characteristic of living matter—that known as metabolism, or the unceasing building up and breaking down of cell-substance which is only rendered possible by the assimilation of new matter from without. So long as there is life there must be this continuous circulation; indeed, some would say that it constitutes the very life-process itself. But is this characteristic really peculiar to living matter, commonly so called? Not so. In a simple form, but with essential similarity of principle, it can be observed in

the burning of a candle, where there is the maintenance of a definite shape together with a continuous stream of matter in a condition of extreme chemical activity. There is more than poetical simile concerned when we speak of the flame of life as blazing up, or burning low, or being extinguished. We cannot here, any more than elsewhere, draw those hard and fast lines which are so dear to the heart of the system-monger; there is everywhere and always a flowing continuity of underlying process with varying degrees of complexity.

And thus we are brought back again to the results of direct experiment. I said that these results were negative; but we must not be too strict in our emphasis on this negativity. Though the chemist cannot produce a living organism, he can do what was for long considered impossible—he can manufacture certain compounds which are essentially products of the processes of life, and can see his way to manufacturing more. More than this, Pflüger drew attention to certain chemical substances, formed at high temperatures, which manifest various activities and reactions bordering on those characteristic of living matter. Burke carried the line of investigation further, and aroused keen interest in the scientific world by his account of certain specially prepared substances which have many properties in common with bacteria. They grow,

they subdivide, they disintegrate, in the well-known cyclic order, and seem to be bacilli of an exceedingly simple type. Bastian goes so far as to claim that he has demonstrated the rise of living from so-called dead matter. And recently a leading professor on a notable occasion aroused a storm of comment by asserting his definite acceptance of the principle of continuity, and basing his belief on scientific evidence.

Now, be it observed that I am not for a moment wishing to minimise or ignore the profound difference between what we now know as living and as non-living matter. I am only pointing out that there is a growing disinclination to acknowledge any ultimate difference between the composition of organic and inorganic substances, or between the sets of forces that are at work in such substances. Nor do I desire to claim too much for such experimental results as I have just adduced ; I would only ask that they be allowed due weight, and not be cast contemptuously or angrily aside. They do not bridge the gap, but they come hopefully near to it ; and they introduce us to substances which are on the borderland between "the living and the dead." Or rather, as I would put it from my own point of view, they tend to show that so-called dead substances are not so much devoid of life, as manifestations of life on a lower plane, and the basis of life that rises

to higher planes. Or to put the matter in another way, I would say that life sleeps in the inorganic world, stirs in plants, and awakes in animals, coming to self-consciousness in man. I hold there is continuity throughout.

If we accept this principle of continuity an important conclusion follows, bearing very directly on the great problem with which we started—the origin of life on our planet. If life is attributed to all kinds of matter, whether organic or inorganic, then the whole of our globe is in some sense alive; and the forms of life which have appeared successively upon it would be specialisations adapted to the varying conditions. What Bergson calls the *élan vital* would be there from the start. This is the view which is to be here developed. It appears to me to be warranted by the leadings of science, and to be consonant with the promptings of a spiritual philosophy of life.

CHAPTER IV

The New Physics

We are witnessing a widespread reaction against the view of the strict upholders of biogenesis, that there is an insurmountable barrier between the organic and the inorganic—between living matter and what they would have us regard as dead or brute matter. Contemporaneously with this reaction, and markedly in its favour, there has been a revolution in our physical views of matter. The old notion was that an atom is a hard enduring particle, with no properties but power to attract and to repel. This doctrine has collapsed, never to return; for we have split up the atom, or rather, watched it disintegrating; and we have learned something of its internal structure. And thus, while, for practical purposes, chemists may be still justified in keeping to their old atoms as the smallest particles which enter into their reactions, the student of physics is moving about in new worlds as yet but very imperfectly realised.

The general facts are fairly familiar to all. Since the discovery of radium, progress has been

rapid and astounding. The minute particles, hitherto regarded as ultimate "elements," are found to consist of groups of still smaller particles. There are few of us now who are not at least on nodding terms with electrons and ions, even though the various stages of the disintegration of radium are lost in a haze of unknown names and mysterious properties. We are thus prepared to learn that each atom is a kind of miniature solar system, and that the distances between its components are relatively as great as those which separate the planets of our system from one another and from the sun. We are also ready to accept the doctrine that the atoms of the chemist have a history of their own, and are so wonderfully stable because they are the survivors in a cosmic struggle which has eliminated all less stable forms.

Much of this new physics is still matter of abstruse speculation, but its general outcome is clear. Matter is being brought into fundamental connection with electricity; and this again is coming to be regarded as stresses, strains, motions, whorls, in ether. But what is ether? Ah, there we pass out of the range of physics because we pass out of the range of the properties which define matter. We enter the sphere of the immaterial. And thus a way is opened out for us now which was closed for the ancient world, as also for the modern until the other day—the

way from the material (or the physical) to the vital and the psychical. The crude materialism of the past is superannuated. The old foundations are broken up, and the new foundations are being laid for cosmologies of vaster range and deeper import.

As an instance of the capriciously true adage that there is nothing new in the world, we may note that the new physics may be claimed by the ancients who taught that Life is Fire or Light ; or, as a modern might put it, a mode of motion. Hippocrates concluded that flames are living—a conception referred to in the last chapter in its bearing on the principle of continuity. The sun has been worshipped from distant ages as the source of life, and its devotees are in harmony with not a few present-day physicists who suspect that the higher forms of life are highly specialised forms of molecular interchange. And so the wheel comes full circle !

We may further note the encouraging lead thus given to biologists. Physicists and chemists had dogmatised about the atoms, declaring they were the smallest possible particles of matter, though some, in spite of great authorities, dreamed even of an ultimate universal substance. Most biologists are still in similar bondage to the cell as the smallest portion of living matter. The atom has lost its unique status, and the cell in its turn will have to go. The atom is now seen

to be a particularly stable composite system, adapted to the existing modes of stresses and strains in ether ; the cell will have to be in like manner deposed from its unique throne, and henceforward regarded as but one kind of specialised aggregate evolved under terrestrial conditions. For biology, with every fresh advance in the physics of the atom and in synthetic chemistry, wider horizons are opening out to view.

Nor is the effect on philosophy less marked or less stimulating. The old crude materialism, as I have said, is defeated on its own chosen battle-ground, that of matter. A new idealism is arising—an idealism which strives to keep in touch with mother earth while valiantly grappling with the mysteries of existence at large. It may be denominated either idealistic realism, or realistic idealism, without any serious risk of confusion so long as its main inspiration is kept in view. It seeks to join hands with science, and is at home in the new conceptions of matter. It believes that the claims of physical investigation are fruitfully compatible with the view that ultimate reality is psychically living. It is not specially anxious to bicker over terminology, but will accept Will, Consciousness, *Elan vital*, Mind, or any reasonable synonyms of these, so long as the idea of life is conserved. For it insists that our own experience as feeling, willing,

thinking beings furnishes the key to the inmost nature of the universe as a whole.

Explanations of life, as being essentially inherent in the nature of things, are by no means new; indeed, in the form of a kind of impersonal animism, they are the oldest of all. The primitive thinker, like the present-day child, vaguely conceived of everything, or at least everything that moves, as being instinct with a life of its own. The Ionian fathers of philosophy took up the idea, and regarded the world of matter as being in some sense alive, and as having given rise to all the specialised forms of life, whether plant or animal. From their time onwards, this hylozoistic (life in matter) theory has never lost its hold on thoughtful minds. It was by no means unknown in mediæval days. In the last century men like Schilling, Fechner, Lotze and Schopenhauer based their whole systems more or less definitely upon it. Until quite recently, however, most "solid" thinkers regarded such philosophers as interesting, but fanciful dreamers, whose speculations lacked scientific basis, and could not therefore be seriously entertained. But now, after the startling and subversive advances in physics and biology, the idea is gaining ground with representative men of almost all schools of thought. James quoted, with vivid sympathy, what are still to most minds the bizarre speculations of Fechner.

Men as opposite in temperament and outlook as Royce, Le Dantec, Bergson and Stout, here have much in common. More especially, the rapid spread and wide popularity of Bergson's treatises are largely to be accounted for because his brilliant guesses chime in so completely with the general tone of feeling and of underlying conviction. Everywhere there are signs that what I hold to be the natural and inevitable world-philosophy is coming to its own.

CHAPTER V

Evolution

Let us take another step forward. If we adopt these wider views and regard all matter as in some sense or degree alive, can we learn anything of the order and of the methods of its manifestations on our globe? The fullest and most significant answer is found in the hypothesis of evolution. How loud and furious was the outcry in the religious world when Darwin first promulgated his well-matured conclusions as to the origin of species! And how delightfully we have most of us adapted ourselves to the new environment which it created!

Let it be clearly understood that when I speak as an evolutionist, I by no means imply an adherence to all the details of Darwin's exposition of his own views. Thanks to his immense care and untiring patience, his work was marvellously compact and lasting. Nevertheless the world moves on, and Darwinism must move with it; it must be modified by endless criticism and amended by endless research. All that I here contend for is the grand basic principle of

continuity, which, in spite of all storms and shocks, stands square to all the winds that blow, and compels fuller recognition as the range of human knowledge expands and deepens.

I have no intention of entering on this vast subject in its general aspects, and I must assume an average acquaintance with its main subject matter. Fortunately "natural selection," "struggle for life," "survival of the fittest," and "adaptation," are now almost part of our common speech, and serious misconceptions as to their broader meanings are no longer to be feared. I shall confine myself to a discussion of the bearing of the evolutionary hypothesis, taken in a large way, on the wider view of life which I am endeavouring to expound and to defend.

Consider the development of a human being. He begins, so far as this stage of existence is concerned, as a microscopic germ, far down below the level of the self-conscious. He passes through various forms and phases which, in a rough way, epitomise the succession of living things on the globe. After a period, he begins a separate life, breathing the air of heaven and looking on the sun. As an infant he slowly gains in definiteness of consciousness ; as a child, he acquires the simpler modes of self-consciousness. He then waxes in wisdom and in stature until he attains to the full dignity of knowing himself to be a son of God.

Have we ever duly perpended the marvel—the miracle of all this? The store of problems and teachings it provides is inexhaustible. But the point on which I would now focus attention is this—the series of changes from the microscopic germ to the fully-developed man is a continuous series; it forms an unbroken chain. There is in the germ (if I may so express it) from the very first, an immanent potentiality of each successive stage, until the last is reached. There is no moment at which we can say a wholly new factor is introduced. And this is what I mean by evolution.

Now, the whole trend of scientific discovery and speculation is in the direction of applying this concept of evolution to the universe at large. It is thus that modern astronomy tells us the story of the heavens, showing us, for example, how suns and systems are condensations from spiral nebulae. It is thus that the physicist tells us the story of the evolution of matter, and of the survival of the "elements." The simplest forms of matter seem to be found in the nebulae, and complexity grows with condensation. It is thus that the geologist tells us the story of the crust of the earth, and describes for us the varied periods through which it has passed to assume its present form and condition. And finally, and most to our purpose, it is thus that the biologist tells us the story of the organic life of

the earth, fossil and existent—the flowing forth of new forms; the gradual appearance of higher forms; the culmination in man.

If we take a sweeping survey of the wide field, we may watch the ether condensing into atoms, the atoms into molecules, the molecules into crystals and colloids, the colloids into cells, the cells into organisms; and then up through the stages of plant, animal, and man. St. Paul apprehended the basic principle long ago:—"First that which is natural, then that which is spiritual." That is to say, the cosmic process is manifested as a rising to higher modes of being through, and on the basis of, lower modes, which thus each and all have their place in a living and organic whole.

We have seen how the new biology has affected philosophy; we are now in a position to ask how it affects theology. And before entering on this phase of the subject, a few general observations may not be out of place. I have pointed out, in an early chapter, how clamantly anxious was the religious world when scientists began to see their way to denying the existence of an insurmountable barrier between the organic and the inorganic. There was a fear that materialism would score. Even had this been so, a lover of truth would have to follow the weight of the evidence and take the consequences. There cannot be two kinds of truth, one for religion

and one for science. But the fear, as I have to some extent already shown, and as I hope to prove yet more fully, was mistaken—we merely gain wider views of God's workings; and the supposed enemy turns out to be a valuable ally.

And, in the long run, is not obscurantism always faithless and harmful? The earth does go round the sun after all, though the religious world took fright, and made Galileo pretend to retract his discovery. Why should so many religious people assume a hostile attitude to every important advance in science which does not forthwith square with their inherited prepossessions? It is surely wiser to await calmly whatever new light may be vouchsafed through scientific research, to strive sympathetically to understand it, and, in so far as evidence and authority are sufficient, to be willing to absorb it into the growing and ever readjustable mass of human knowledge. Had such a spirit prevailed in the past, we should have heard much less of the conflict between science and religion. There are signs, however, for which we may be devoutly thankful, that there are better days ahead.

The special need of readjustment in the case before us appears to be the harmonising of our ideas of creation with those of what I have termed the immanent potentialities of matter. And it is to this problem that we now turn.

CHAPTER VI

Creation and Process

Until quite recent times, the prevailing theory of the origin of things was that known as "creation." Strictly speaking, this term simply means "bringing into existence," without specifying any conditions as to times or methods; and, had this simple meaning been adhered to, the coming of the evolution hypothesis need have occasioned no trepidation. But chiefly owing to the fact that the grand and poetical imagery of the opening chapters of Genesis was mistaken for the terminology of exact science, two other ideas were added to that of simple origination. The ordered succession of the six days' work was interpreted to imply a succession of *special* creations. And the sublime utterance, "Let there be light," expressive of the old, indeed, primitive feeling that with God will and deed coincide, emphasised the *instantaneousness* of the creative act. Hence the theory of special creations, taking place at definite times, found itself in sharp collision with that of continuous process.

The dust and confusion caused by the impact have almost subsided, and we are beginning to realise that the damage is in no way serious, still less fatal. We may grant the substantial truth of the contention that, with God, will and deed must coincide. But we may go on to ask why God should not will a process. Merely to raise the question is to answer it; and thus evolution can take its place as one among the many ways in which God fulfils Himself. The road is cleared and laid for unprejudiced research. And if the evidence is sufficiently strong, we may follow without dread of its bringing us to a volcanic region when we shall feel the foundations of religion rock under our feet. And, after all, is not the God in whom we believe the "God of the ages." Is He not the God of history? Did not He Himself abide the coming of the "fulness of time" before He manifested Himself in and through "the Word made flesh?"

We need not hesitate, then, to sit loosely to the idea of a necessary instantaneousness in the creative act; there need be no disloyalty to the idea of creation as such. Lapse of time makes no essential difference to the result. Moreover, by adopting the idea of process, no longer should we have to demand definite specific acts of creation for any particular groups of things or living beings; still less to insist on the immutability

of the products of such acts. For "process" implies a flowing progression from form to form—an organic development in successive stages.

To substitute continuous action for immediate act is not to remove God from the world. For even on the deistic assumption of what would be practically an absentee God, we may hold, with Huxley, that if there is proof that any process was set going by any agent, then that agent is the creator of the process and of its products. But we are not deists: we believe that God is immanent. We build on the assurance that God is working in and through the process. "My Father worketh hitherto, and I work." What need we further authority, as Christians, for embracing the idea of the evolution of the universe? Conjoin with this declaration of God's continuous activity the sublime conception of the creative Logos, in Whom "was Life." Can we hesitate to hold, not only that the universe is evolving, but that it is a living organic whole?

Let it be observed that to speak of an immanent life evolving in the universe is not to solve the mystery; but neither does the account in Genesis solve the mystery. We have to study the facts and deduce as much as we can of their order and their meaning. The evolution hypothesis tells us something of the How? but nothing of the Whence? or the Whither? To say that the fittest survive is evidently a simple

statement of fact—almost a truism, though a significant one. To speak of "selection" is not to tell us how the selection originates nor why there is this or the other specific selection. Moreover, at its very best, it is a negative agency only; it brings it about that this or that species actually survives, but it does not create the species nor any single one of the variations which have afforded material for selection to work upon. Why then should the hypothesis have been so dreaded by the religious world?

The main cause of the dread has been, I presume, the linking of man to the forms of life beneath him, and the apparent loss of his unique place in nature. And yet the inference is easily seen to be unsound. Man is what he is, let his originbe what it may. His experience—sensuous, emotional, intellectual, æsthetic, and religious—does not become other than itself whatever theory we may adopt as to its source and development. And it is on the actual facts of experience that even the ecstatic mystic must rely when he would understand himself or the universe, or God. It is true that if we accept the theory of evolutionary continuity, man will not be deemed a special creation, and so far the older view will have to be modified. But we retain all that was really valuable in that older view, if only we firmly grasp the conception of the universe as a living organic whole. Man's very materiality is

recognised as being but one phase of his spirituality; and new light is thus gained for the Christian emphasis on the dignity and the future of the body. We can also read fuller meaning into the vivid expression of the Apostle's own experience—"the Spirit beareth witness with our spirit that we are the sons of God"—for it is this life-giving Spirit that broods over and fosters the whole upward development of which man is here the visible crown.

And as for the sub-human world, organic and inorganic, man flings back upon it the rays of his spiritual glory; it is linked on to his hopes and to his destiny. Was not this one of St. Paul's swift flashes of cosmic insight? "The whole creation groaneth and travaileth together in pain until now"; it eagerly looks out to the far horizon of the brighter day yet to dawn, "waiting for the adoption, to wit, the redemption of the body"—that is, for the lifting of the whole process on to a higher plane.

Man, then, is not lowered by being linked on to the visible universe which is his home; the facts of his soul life remain unchanged, and give to the animal world and the realm of inorganic matter abiding worth and spiritual meaning. He is the supreme proof that the cosmic process is a revelation of the Divine working, an unfolding of the Divine purpose.

I plead, therefore, with religious thinkers for a

recognition of the potentialities of matter. It is not dead ; it is living. The body of an animal, the body of a man, is not a mere tenement of lifeless clay ; not a bit of mere machinery, used by a soul ; it is itself alive, spiritual, and an essential part of the being of whose activity and will it is a manifestation. The properties of matter rise up through various stages : sensibility, will, consciousness, intelligence, reason, conscience, spiritual life. The universe is living, and moves in one vast harmonious sweep ever nearer to the throne of God.

CHAPTER VII

Life as Organising

I have argued for the principle of continuity, and have pleaded for its recognition by religious thinkers; I now turn to consider this universal life in certain of its more prominent functions. The first to engage our attention shall be its truly marvellous organising function, which produces increasingly complex co-ordinations of parts in more or less perfectly individuated wholes—the function so majestically bodied forth in the imagery of the opening verses of Genesis, when the Divine Spirit is pictured as brooding over the primeval chaos and evolving from it order and harmony and beauty.

Let us carefully observe that the process is represented as continuous, as prolonged, and as progressive. And if we look out on the heavens with the eye of a modern astronomer, the continuity of this organising activity is overwhelmingly brought home to us. Under the action of gravitation, we see stars systems actually in process of formation, nebulæ condensing, clusters changing, suns and moons

throbbing and heaving with glowing fires, or cooling and inert. The whole heavens are in constant motion ; the fixed stars are themselves traversing space with astounding velocity. And all these movements, changes, developments, are not of to-day or of yesterday, but stretch back through unknown æons. There is no trace anywhere of a starting, nor of a tarrying, nor of an ending—simply an eternal process moving on. And, what is even still more significant, all the stages, from the simplest to the most complex, are contemporaneous, co-existent. The Divine Spirit is brooding now, as in the past ; guiding the living whole through the continuous chains of evolution, and changing them from glory to glory.

And so, also, with the indefinitely small. A drop of water, could we perceive its inner construction, would be a far more wonderful sight than the starry heavens that are within our ken. If we could magnify the drop to be the size of the earth, we should see millions of millions of molecules, each, on that scale, about as big as a cricket ball, each itself a triplet—dancing like gnats in a summer swarm—colliding and rebounding millions of times a second—dissolving partnership and recombining in an endless play of intense activities.

Each molecule is a triplet ; that is to say, it consists of three atoms, combined in a special

way. And what of the atom? It is itself a centre of enormous, bewildering motion and energy, a system of mysterious factors kept in equilibrium by their interwoven rotation, attractions and repulsions—an aggregate of particles seemingly composed of electricity, travelling round each other with speeds that are measured by the speed of light (180,000 miles a second). Such is the story that modern science has to tell!

My contention is that all this organising, on the scale of the inconceivably large, as also of the inconceivably small, is a manifestation of the inherent power of life; and that what we so lightly call dead, or brute, matter, is in reality a particular phase of manifested life, and therefore ultimately spiritual through and through. It marks one stage of the universal striving upwards to subtler harmonies of form and of experience. As Ruskin noted, the earth seems to burst forth spontaneously into order and beauty. Amorphous matter congeals into crystals along the veins of ore; the fresh scars on a face of rock are soon clad with exquisite lichens, lithe creepers, adventurous seedlings. And this is but a typical activity, a characteristic by which to judge the whole.

When we turn to the world of organisms more strictly so-called, we are met by still more striking proofs of the organising power of life; for we find a practically infinite variety of structures,

built up into co-ordinated wholes so complexly delicate as to be the despair of physiologists, equipped with all the apparatus of the modern scientist. What of the cell, the typically simplest form of organism? Professor Thompson tells us that a cell very much smaller than the smallest dot on the face of a watch may be compared, for complexity of definite structure, to an ocean liner filled with framework as tiny as that of the daintiest watches. What shall be said, then, of a human body, composed of myriads of such cells, and interrelated in still more myriads of ways? Add to this the fact that the structure so built up is not a static one, like a building reared of stones, but a moving equilibrium. It is continually breaking down and wasting, and as continually taking in matter to repair, and, during growth, to extend its tissues.

During growth! Consider the little patch on the yolk of a hen's egg. When placed under certain conditions of temperature, it undergoes a series of transformations that are beyond measure marvellous; until at length the little chick chips its way out of the shell and emerges with tissues, nerves, muscles, organs—all in working order, a miraculous little fluff-ball of intense vitality. And more, it begins its career with no small store of mental qualities; it is no mere cunningly wrought automaton; it has instincts and appetites; and what is still more significant, it can

learn by experience, and so far, and in its measure, has the hall-mark of reason. In due course it develops into the full-grown bird—itself becomes a mother, and manifests a touching care for its offspring.

Transfer your attention to the human race, and to the drama of human history. Consider the history of language, of the arts and sciences, of clothes, of manners, of laws and parliaments, of philosophy, of morals, of religion. Where shall we stop? What is the moving power? To answer such questions we have to look within our own minds. By studying the nature of our own experience, by tracing the development of our own powers, we have a window through which we can look out on the inner life of the universe. We feel within ourselves the promptings to fuller life. But we are part of the cosmic whole, and these promptings are common to the whole. One of the means by which we attain our end is organisation. So with Nature, which evolves growing complexities of structure and function, ever striving upward. "First that which is natural, then that which is spiritual."

CHAPTER VIII

Life as Purposive

I TRUST I have now sufficiently shown that the doctrine of continuity, so far from being materialistic, is one of the doughtiest antagonists that materialism has ever yet encountered. Since, however, it is unhappily the case that many upholders of continuity and of evolution, while discarding the cruder forms of the older mechanical theories, have merely changed their ground and not their essential principles, it may be well to consider in rather fuller detail what I would call the purposive aspects of the evolutionary process. Is it all the result of a continuous push from behind?—of an iron chain of cause and effect?—a closed system in which the condition of things at any given moment is simply the determined resultant of their condition at the previous moment? Or is there a spontaneous, purposive, creative factor in the process, which carries us on into new continents of being and of experience?—inspires adventure and enterprise?—stimulates wider hopes and fires with nobler ideals?

To uphold the purposive and expanding aspects of life is not to deny its mechanical aspects and conditions. I may at once say that I am in fullest sympathy with those who would push physics and chemistry to the furthest possible point in every branch of enquiry, including human minds and institutions. But I refuse to be incarcerated in a prison so narrow when I would pierce to the heart of existence, and understand life as it wells up from its deeper sources. The categories of physics and chemistry cover only one section of human experience—the aspect that is the most abstract and the furthest removed from the characteristic features of life as it is actually lived.

But it may be said that I myself have endowed matter with the potentialities of life. Most certainly this has been my main theme. But by so doing I claim to have lifted it out of the merely physical categories. The upholders of the physical causation theory, while professing to dispense with other categories, more or less unconsciously smuggle them in. They thus manage to deceive themselves, by the multiplicity and complexity of their formulæ, into thinking they have entered the temple when they have not reached its threshold. They give us some exceedingly ingenious descriptions of the conditions which render evolution possible ; but the secret of the process, its *élan*, its mean-

ing, for ever baffle and elude them. The life of even an amœba is more than physics and chemistry can ever explain. What then of the life of a Newton, a Shakespeare, a St. Francis d'Assisi ?

Those who hold that the state of the universe at any given moment is absolutely and solely the effect of its state at the previous moment are confined to one mode of causation—that which I have called the push from behind. Let us join issue with these thinkers. Let us ask them whether there are not actions which have reference to something not existent at the time of acting. In other words, is there not such a thing as a purposive act, prompted and guided by an idea of the end to be gained in a future, near or remote ? If we have to answer this question in the affirmative, then we have also to recognise a type of causation which we may call the pull from the front. We shall be clear of the nightmare of purely mechanical determinism, and be able to attach some real meaning to the phrase " the will to live."

Haeckel says that an animal sees because it has eyes ; it does not have eyes in order that it may see. An animal butts because it has horns ; it does not have horns in order that it may butt. So far as I am able to enter into the subtleties of this distinction, it seems to me to be a variant on the old puzzle—which was first, the hen or the

egg? But its intention is to rule out purpose from the universe.

Since we have not first hand experience of the growth of eyes or the lengthening of horns, let us apply the principle to cases into which we can enter with less difficulty. On these lines we must say that a spider does not weave its web to catch flies, but catches flies because it weaves a web. It does not have digestive organs to digest flies, but digests flies because it has digestive organs. The paradox is becoming too trying! But there is a loophole of escape in the contention that we cannot enter into the consciousness of spiders and cannot therefore judge its motives. But then neither can Haeckel!

Let us, then, bring the matter within the range of human consciousness, and appeal to our own experience. A fisherman does not make a net to catch fish; but catches fish because he makes a net. A bowler at cricket does not bowl to hit the wicket, but hits the wicket because he happens to bowl. Here the paradoxical passes over into the absurd, and common sense repudiates such a travesty of what is matter of direct knowledge.

But it will naturally be asked—Do the push-from-behind people really maintain such nonsense in regard to human action? Well, if they are consistent, they are bound to maintain it. Some of them say that we must not take human

actions into account, or read ourselves into nature; man is exceptional. Ah! that is the nerve of the question! They are pre-eminent in accepting the principle of continuity, and hold most steadfastly that man is a part of Nature. But if man can act with a purpose, then Nature has produced a being capable of being influenced by an as yet non-existent future. It follows that the condition of things at any moment is not solely the effect of the push from behind.

Pushed on himself, then, by logical consistency, the push-from-behind champion blinks the facts by affirming that our consciousness of purpose is an illusion! Truly a desperate solution of a problem of which we may safely affirm, *solvitur ambulando*. There is nothing save machinery, say these negative theorists, set going from time to time by various stimuli. True, we have a consciousness of effort, of willing an action; but this is only a deluding by-product—or, to use the term that serves to give a varnish of dignity to such absurdities, an epiphenomenon. The only two arguments I shall advance are very brief and very simple, but I think sufficient. How can a machine have a delusion? That is the first, and the second is like unto it. May not the phenomenalist himself be under a delusion?—a terrible suggestion for one so sure of himself, but still a possible one!

CHAPTER IX

Purpose and Watches

Such are the sophistries by which special pleaders try to support hopeless positions. Strange as it always must seem to healthy minds, certain scientists are obsessed by the idea of emptying life of all hope and all meaning. And since formulæ—mathematical, chemical or other—are neat and handy (shall we say, comforting?) life must somehow or other be forced into the moulds they provide. But an appeal to experience suffices to shatter such moulds. We know our own minds at first hand; all else shades off into more and more distant regions of the unknown. And our experience tells us that purposive effort is a fundamental fact.

We start, then, with the existence of genuine purpose in ourselves; we actually know the "feel" of a pull from the front, as well as that of a push from behind. We proceed accordingly, knowing ourselves to be linked to the universe, to read our own experience backwards into the forms of sub-human being. The spider may, or may not, have some consciousness of the

purpose of its web; but at any rate it has a desire for food, and is prompted to certain activities in order to satisfy its desire. In the case of purely instinctive actions, we may hold that the purpose is implicit rather than explicit; but even here, the pleasure attending the healthy exercise of functions guides to actions which make for individual or racial welfare in the future.

Some of my readers may be wondering why I do not utilise the old argument from the evidence of design in the universe when I would prove the existence of purpose. Well, there can be no doubt that the coming of evolution has administered to this old argument some very staggering blows, though I most firmly maintain that in its essential bearings it is unconquered and unconquerable. Still, the issues are not so clearly cut as aforetime; and that is why I preferred the appeal to direct experience.

In its older form, as advanced for example by Paley, the argument from design was based on the idea of special creations. Take an instance of its employment by the just mentioned author of the famous "Evidences." A man sees a watch lying on the heath; he has not come across such an article before; but inspection shows him adaptation of part to part, and therefore he argues to a maker. So when we examine the wonderful adaptations in Nature, more

especially those manifested in such organs as the human eye, we are driven to the belief in a Creator.

Now, the cogency of this argument apparently dissolves when we learn the history of the development of the eye in the organic world as a whole, beginning with the spot sensitive to light, on through the various stages more and more complex, until we come to the powerful organ of vision possessed by most of the higher mammalia, and by many of the birds. We see how that under the agency of what is called " natural selection," the structure of the eye has been gradually built up, as human selectors build up new varieties of fruits and flowers, and animals. The scientist who would deny the existence of purpose in the evolutionary process, ascribes " natural selection " to the play of blind forces. Everything, as we saw, is for him due to the non-purposive push from behind.

But let us come back to Paley's watch. The cardinal omission of this philosopher (as of the whole school which he represents) is that he views things too externally. He looks at the watch lying there on the heath, but forgets to take into account the being who is looking at it. And yet you cannot, either in fact or theory, separate the two. If a bear happened to come along and see the watch, it would not suggest to him, though his mind be cunning, that the

machinery implies a maker; though it might arouse his curiosity, and possibly, through its scent, suggest the proximity of a man. That is to say, purpose is not an external thing, but implies a relation to a mind, and is only recognised in the degree to which the observer himself can form a conscious purpose.

With this condition in view, let us return to the man who finds a watch on the heath, and wonders what it is. He examines its machinery, admires the adaptation of part to part, and, drawing upon his own experience, rightly argues that it was made with a purpose. Suppose he then meets a watchmaker, and asks for further information. He finds that the purpose of the machinery is to measure time; that is to say, the man does not tell the time because he happened to make the watch; but made the watch in order that he may tell the time.

We gather, then, that in the universe as it actually exists, there is a watchmaker who makes a machine with a definite purpose, and an observer who can recognise that purpose. What does the non-purposive scientist make of these two beings? We have seen that he can only take refuge in an absurdity, and assure both of them that they are under illusions!

Paley's argument must thus be modified in two ways if it is to retain its cogency. In the first place it must substitute creation by process

for special creation—a change which leaves the underlying principle intact. And secondly, it must lay greater stress on the active purposive striving manifested in the universe—the *élan vital*, the will to live. The human eye is then recognised as an outcome of an innumerable series of purposive efforts to see put forth by an innumerable series of beings that have striven for greater fulness of life. The particular form assumed by the eye is regulated by the particular environment in which it has been developed, but the purposive effort is the moving cause. An organism is not like a lot of drifting seaweed, pushed hither and thither by forces purely external to itself; there are "subjective urgings, impulses and strivings from within—there are internal formative activities which use the materials and conditions of the environment for their own welfare." Darwin's phrase, "the struggle for survival," represents an ultimate fact:

> "Striving to be man, the worm
> Mounts through all the spires of form."

The house of a snail is no more made solely by a will, or by forces outside the snail than a man's house is made solely by a will or by forces outside the man. In each case there is an objectification of a centre of the will to live. In each case there is a manifestation of life as an organising agent. The consciousness of such purpose

is, in the early stages, obscure, but gains in clearness and definiteness as we mount the scale of life. In man it takes what is, so far as our visible universe is concerned, its most developed form, and in the noblest representatives of our race becomes a determination as universal as that of Goethe, " to live in the whole."

I have said that if we would understand what is the secret of the inner working of the universe, we must look within. We must use our own soul-life as a window. How does our own will act ? It sets in motion a multitude of nerve tissues and cells which are co-ordinated into a living unity. We cannot tell how, but the fact remains as one of the most undoubted of our existence. We translate our purposes into changes of our body or of our environment. And such spontaneous activities are creative in the fullest sense of that much debated term—they are will-processes working themselves out in development, growth, expansion—they bring something new into existence. The world is not a closed system pushed eternally from behind. It pulses with hopes and aspirations and ideals. It shares the life of God.

CHAPTER X

Biology and Immortality

A FATEFUL question here presents itself. All the forms of life which are known to us through the senses have a beginning and they also have an end. Plants die; animals die; human beings die; nay, heaven and earth are themselves changing and passing away. What, then, are we to think of death? Can any living creature, can man himself, hope to survive the dissolution of his physical organism? This is the great problem which I now approach; not in its full extent, but purely from the biological standpoint, that is to say, I put aside all the usual arguments for immortality, whether ethical or emotional, whether metaphysical or theological, and confine myself to the data supplied or suggested by the science of life.

A certain biologist has defined life as being "the assemblage of forces which resist death." On the one side, that is, there are the limited powers of resistance possessed by an organism, and on the other the unlimited powers of destruc-

tion possessed by the universe. Life is thus a war without truce, a conquest always and everywhere disputed. To maintain the fight is to live; to be overcome is to die. The outcome of the unequal conflict seems to be inevitable.

Such a statement of the case may be accepted if interpreted in a large and general sense. It is capable, however, of significant restrictions if we confine its scope to the conditions which allow of the continuance of organic life as we know it. For example, Weismann startled the world some years ago when he claimed potential immortality for certain organisms of extreme simplicity—such as the one-celled protozoa. Such organisms may of course come to an accidental or a violent end; most of them do. But the point here is that, so far as the nature of their structure is concerned, they are able to maintain the conflict victoriously and continuously in the given environment. Their life processes, as such, do not grow old and decay, as is the case with the body cells of the higher animals. The individual cells subdivide from time to time; but there is no part rejected—nothing dies. And thus we are warranted in the remarkable conclusion that natural death is not a necessity for all organisms. There is constant breaking down and building up of substance; but, so long as the right environment continues, the

organism as a whole maintains its functions unimpaired.

We have already gained much food for thought; and we can advance more hopefully to consider the case of the many-celled organisms. Let us again follow Weismann's lead. For although we cannot at all accept the details of his theory as final, they fix attention on certain outstanding facts which, under any theory, retain their essential significance. He draws a distinction between the cells which constitute the germ, or seed, and the cells which constitute the body; and for the former he claims the same kind of potential immortality as for the one-celled organisms. Consider, for example, a grain of corn—the organism chosen by St. Paul in his argument for human immortality. It contains certain germ-cells, which, under favourable conditions, will clothe themselves with a new body. They use this new body for their own maintenance and protection, and by means of its structure and functions gather themselves together into seeds like unto those from which their own generation started. When these new seeds are ripe, the body, having completed its functions, decays and dies. The process is repeated in each generation; the successive bodies die; the germ-cells live on, and are potentially immortal. This is the pregnant truth underlying the apostolic analogy; and it applies to the

whole realm of many-celled organisms, including man.

Simple cells, then, have no body, and are able to sustain the equation of waste and repair for an indefinite period. The many-celled organisms have developed a body; and with the advent of this body, death came into the world; the part which becomes superfluous decays and is dissolved. It is this potential immortality of germ-plasm which affords the basis for heredity, and affords scientific warrant for St. Paul's teaching concerning "the first Adam" and the solidarity of the human race. Sachs has given fine expression to this arresting phenomenon in its wider sweep. "That which has maintained itself alive, and has continually reproduced itself since the beginning of organic life upon the earth, moving steadily onward in the eternal change of all structures, in the unvarying alternation of life and death."

Biology thus tends to correct our impression that terrestrial life, as such, is of its own nature necessarily perishable. We find that on the contrary, given favourable conditions, it possesses the secret of continuous reconstruction. Death itself is seen to be a servant of life. But some may ask whether so portentous a happening as the death of the body was really called for to secure the end attained. Well, there are other aspects of the life and death of the body, especially

in the case of man, which render it a factor of prime importance to mental and social evolution—aspects which are too wide in their bearing to be discussed here. Keeping to the scientific point of view, we have to acknowledge that the answer to such a question is out of the reach of the biologist. But certain comments suggest themselves.

There are some who say that death is a necessary condition of all life ; that, so far as we know, life is dependent on death. We have seen reason to doubt the validity of this assertion. It is far too sweeping. It is true that life, so far as our experience of it carries us, is dependent on change ; but we have no warrant to substitute for change the much more restricted term "death." As a matter of fact, we know that most living organisms do, directly or indirectly, maintain themselves at the expense of other organisms. The victims, however, as I shall maintain in another chapter, suffer only a temporary check in their development.

Certainly we need not on this score cease to rejoice in the organising activities of life ; for it is ever building up from the constituents in its environment other forms of greater complexity and richness. And, as we have seen, in the plant world this building up is almost wholly from inorganic matter—that is to say, there is at the basis of the organic life around us a process

of assimilation which does not impose the penalty of death. In other words, life does not always nor fundamentally imply death as its condition. Nor is there any death for Nature as a whole—its youth is eternal; its activities and transformations inexhaustible. And even what we call death may itself be viewed as merely clearing the way for further advance, while involving no permanent loss to any living creature. It breaks the mould of imperfect forms, and is thus, as Goethe said, "an artifice of Nature" to secure that fuller and richer life for which the whole creation yearns.

In my first chapter I set out by referring to the amazing variety of the forms of life, past and present, to be seen in a well-stocked museum of natural history, and I pointed out that deep questionings inevitably press themselves upon us as we roam through the galleries. One of those questionings springs from the evidence of constant succession—species superseding species, form superseding form. And now we have come in sight of at least one partial explanation of this evanescence. What if the dragons of the prime had been immortal! What if the earliest and lowest forms of human beings had been immortal! What if we ourselves, with our present range of faculties and dispositions, were immortal! No, there must be change if there is to be advance, and we, in our turn, must be

ready and willing to bow to the universal law of progress, without fear for the ultimate result. So far, and so far (but only so far) we may accept Pope's version of the facts:

"All forms that perish other forms supply,
By turns we catch the vital breath and die."

CHAPTER XI

Individual Immortality

We conclude, therefore, that life is not necessarily or unconditionally linked to death—not even when we confine our view to the organisms that strive and thrive around us; still less when we range out into the universe at large. At this point, however, there presents itself a still deeper problem. The life in Nature, as a whole, may be inexhaustible. But what of the individuals whose perishing bodies rise and break like bubbles on the sea of matter? What of our individual selves? Will our personal centres live on under changed conditions, or will they be merged in the universal whole? Here we reach the very heart of our subject. Let us remember that we are at the biological point of view, or we shall be lost in many wanderings.

Even when we limit ourselves to biological considerations, we must be content to pick and choose; for the amount of material is very great. For instance, we might profitably dwell upon the ordered changes from grub to chrysalis, from chrysalis to butterfly. Believe me, the new

knowledge enhances, rather than diminishes, the larger implications of this truly marvellous series of transformations. May we not be building up in materials, ethereal or other, still inaccessible to the feeble range of our senses, a body which will pass on when we shuffle off this mortal coil of flesh?

Or I might emphasise, with equal, if not greater evidential force, the fact that sleep is a literal dying, involving loss of consciousness, break of memory, repair of tissues, and an awakening to life under genuinely changed conditions. I should argue from this that sleep and death are very near akin, not for poetry only, but also for science; and that death, as a mode of profound sleep, prepares us by subtle, unperceived processes for an awakening on a higher plane of existence.

But forsaking these tempting paths, I must take you back once more to the human embryo, with its enormously complex construction—like unto a prodigious fleet of large liners filled with the most delicate of watches. Originally of the tiniest dimensions, it gathers round itself other constituents which it rapidly builds up in a structure of increasingly intricate complexity, and guides a growing mass of material through a continuous series of changes until the fully developed man stands forth in the glory and dignity of body, mind and spirit.

Let us fix our attention on this complex unit,

not for physiological analysis, but for recognition of its powers of assimilation and construction. It begins on so tiny a scale; but it can wax so mightily by using its environment for embodying and asserting its will to live. What happens to this original centre when the body dies? It would seem that it is subject to dissolution like the rest. But a cell (the biologist's unit) has within it a specially active part called the nucleus —and within this again, there are still smaller centres of ordered activity. We are off on the line of exploration which took us inside the atom. And where shall we stop? No one can tell us; perhaps we shall never know—but the indefinitely small remains as real as the indefinitely great.

Now let us suppose that we do come to an ultimate nucleus, which is the mainspring and guiding agent for all that follows, the centre round which all else crystallises. We should pierce here to what would be, in sober literalness, the core of individuated life. Of what nature shall we deem it to be? Modern science tells us, with no uncertain voice, that we are on the confines of what we call matter, even if we have not actually crossed the boundary into the realm of the immaterial. You will recall my statement that the ether is beyond the reach of our physical methods, and even of our conceptual categories —that it is ultra-material. It is the mother stuff

of which the universe is constructed; and life would seem to be (in concrete terminology) a mode of motion in this transcendent mode of existence. The ultimate nucleus of a cell would thus appear to be something that is passing out of the reach of science, and laying hold of the psychic or spiritual plane of existence.

In pursuing further this line of speculation, we may safely lean hard on our consciousness that we men and women, whatever else we may be, are, in some very real sense, separate beings —individual striving centres. I am not here attempting to adjudicate on metaphysical issues; I am simply taking the deliverance of common experience when we think and speak and act as individuals. Here we are, British and French and Russian, German and Austrian and Turk—each and all of us individually, as well as in various co-ordinated groups, struggling to declare ourselves as over against each other, and as against the universe in general—each and all striving, wisely or unwisely, successfully or unsuccessfully, for fuller life. And we every one of us started on an ultimate nucleus of the kind I have postulated. The same is true of every organism that exists, or has existed, on our earth. To these ultimate cores of individual existence we might, for the sake of definite thought and useful discussion, give the name of "vital units." They would be the biological equivalents

of what I have often called, in Schopenhauer's phrase, "centres of the will to live."

The main drift of my argument should now be obvious. If these vital units are on the very threshold of the immaterial, or have already crossed it, they are not wholly amenable to mathematical calculation, nor to physical methods of research, nor to chemical formulæ. They pass out of the ken of physical science. And, evidentially viewed, they afford right of way to those more metaphysical discussions of immortality to which on other grounds we may incline.

As simple and irrefutable matter of fact, these embryonic starting points for organic development as we know it, do actually build up bodies of varied kinds and of varied orders of complexity. And equally, as matter of matter, we can trace a structural development from the electron up to the embryonic cell. If we suppose an ultimate vital unit to be a persistent centre in an ultra-materialistic medium, then it will be the final example of the kind of immortality which Weismann claims for the one-celled organism and the germ-plasm. It would survive the death of each and all of the successive bodies, many or few, in which, in any given environment, it may clothe itself. And there will then open out for us, as individuals, an endless range of potentialities, not in this world only, but also in any other mode of existence which may await us beyond the veil.

CHAPTER XII

Palingenesis

What is the kind of doctrine to which such speculations most naturally lead? At first sight we might be tempted to think of the venerable theory of metempsychosis, that is, the passing of a particular soul from body to body in a series of reincarnations. But this would be to misunderstand the true implication of the continuance of a "vital unit." This need not at all be, and indeed cannot be, that of a homeless soul waiting to find a new material dwelling. It is rather the persistence of a germ which assimilates to itself new materials in varying environments, and forms a nucleus for the co-ordination of varying parcels of living matter. How unexpected in its transformations is the human body as it "grows" from its earliest stage, through childhood and manhood on to hoar old age! There is continuity throughout, but constant change of material and of form. We have but to extend this continuity on through the change called death, allowing for a more complete casting off of the old materials to arrive at the view which I would

advocate. St. Paul's analogy is quite in harmony with this thought; the old body dies, like a stalk of corn; the vital unit, like the germ of life in the grain, under suitable conditions clothes itself with a new body.

In spite of its pre-scientific phraseology, St. Paul's analogy is thus shown, by modern science, to be profoundly suggestive. And we are now familiar with another striking phenomenon of like speculative import, that known as the regeneration of lost parts. For example, if, in catching a lizard, you seize it by the tail, the little creature leaves the trapped appendage behind, and slides off into safety. Were you then to catch the lizard and keep it, you would find it would grow a new tail, hard to distinguish from the original. The newt also has still more remarkable regenerative powers; it can grow afresh many of its parts—legs, skin, and even an eye! I must content myself here with the mere mention of these curious facts, without dwelling on their significance for the theory of evolution, or attempting to explain why certain creatures should have developed the powers, and others not. So far as we human beings are concerned, we have only moderate abilities of this kind; though the same kind of regeneration on a less complete scale is seen in the healing of wounds. One of the most probable theories as to the nature of the process is that which sees in

it a complex play of forces re-establishing an equilibrium, like those at work in repairing a fracture or loss in a crystal.

Now this very term "regeneration" links on at once to the New Testament conception of "palingenesis," a Greek term which is rendered "regeneration" in our English versions. "In the regeneration when the Son of Man shall come." What meaning do we attach to these words? We naturally connect them with St. Paul's magnificent picture of the whole creation, eagerly straining into the future, yearning together with us, "waiting for the adoption, to wit, the redemption of the body." Let us carefully note here that it is not man only that is concerned in this "far-off divine event," but the sentient creation, and the earth as man's home. There are to be "new heavens and a new earth," as well as new bodies for human beings. This is not metempsychosis; it implies much more a dissolution of certain forms of being, and a reshaping of them on a higher plane.

If we adopt this view of palingenesis, we are able to give a new turn to the next lines to those I quoted from Pope. Living creatures, he says, are:

> "Like bubbles on the sea of matter borne
> They rise, they break, and to that sea return."

Let us change the idea of a bursting bubble

into that of an eddy, or a wave form, and let us think of the eddy, or the wave form, as persisting in the bosom of the vast expanse. There are many experiences which will help us to follow up such a line of thought. For example, have you ever stood on a lofty cliff, and watched the rings that circle outwards from the spot where a sea-bird has dipped into the dimpling surface of the water? If so, you will have marked how that, in spite of the heaving swell, in spite of the multitudinous crossings and recrossings of the wavelets and ripples, each ring cuts its individual way as though it were travelling on the still mirror of a mountain tarn. Each has its individual existence, and yet each is embraced in an all-pervading system of law and order. We thus gain a glimpse into the nature of the vast ocean of being, which, though it is comprehended in a measureless unity, nevertheless finds a place for all the wealth and variety of individual centres of the will to live.

But perhaps you will say that the ripples thus started by the sea-bird do ultimately lose themselves in the general mass and movement. I am not at all sure that I should be willing to grant this; for if we rule out differences in mere space relations, the stresses and strains set up remain, and modify the whole of the ocean in some definite way. Let us turn, however, to another kind of experience. Have you ever watched

the tremulous motion of a magnetic needle, and realised that those delicate swingings and swayings bear witness to the existence of the indefinitely vaster and mightier ocean of ether?—an ocean pulsing with subtle forces, and allowing of the minutest stresses and strains with the same majestic ease that it effects the birth-throes of new stellar systems? Here we realise still more vividly that the unity of Nature does not exclude the existence and persistence of the indefinitely small.

But again it may be objected that, physically viewed, these stresses and strains are merged in the general play of forces, just as in the case of the ocean of waters that lave our coasts. And again I should express the same reservation of judgment as in this former case. We have, however, in the ether not merely a subtler body than water, but one which, as I have often insisted, passes beyond the physical categories. And one trend of speculation in its regard is more particularly germane to my chief contention. We have been told by great authorities that in a perfect fluid any eddy or vortex is indestructible. Now, if we suppose our vital units to be eddies (spiral or other) in the ether, or in some medium even still further removed from matter, we begin to see that the idea of immortality is not so alien to the teachings of science as is generally supposed and maintained.

There is no absolute proof; but possibilities are opened out which augur well for the future reconciliation of science and faith in respect of the doctrine of a life beyond the veil.

So much for the ocean of waters and the ocean of ether—and for any other ocean of subtler essence that fills the immensities of space. If these can suggest such thoughts, how is it when we come to meditate on the all-embracing ocean of the love of God? To speak of this would lead us beyond the limits I have imposed on myself, and would launch us on some of the central problems of metaphysics and theology. But this much can at least be said. It was by meditation on the beauty of the flowers of the field and the happy trustfulness of the birds of the air that Jesus Christ told us we might understand something of the divine love. And further, He taught us that the God Who loved the fathers is a God of the living, not of the dead. And how could it be otherwise? For the persistence of the individual is essential, as Dr. McTaggart has so finely argued, to the very nature of love. It implies a spiritual bond between conscious beings who find themselves in each other, and are enriched by participation in each other's life.

And should there be any who are staggered by the thought of the inconceivable number of the centres of the will to live, let them remember that there are at least two inexhaustible realms

to be peopled—that of the infinitely great and that of the infinitely small. In the All-Father's home are many mansions; and in the All-Father's heart there is room for every creature that feels the prompting to fuller life. We know that He lavishes beauty on the lilies of the field—that He notes the sparrow's fall. We know that His Son came "that we might have life and have it more abundantly." With this knowledge to sustain and to cheer, we may well re-echo Victor Hugo's quiet note of confidence:

"Like a song-bird be thou on life's bough,
Lifting thy lay of love.
So sing to its shaking,
So spring at its breaking
Into the heaven above."

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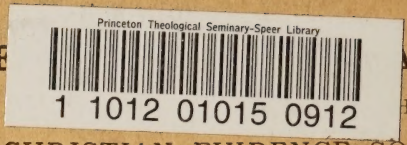
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